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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

Vol. IV.—No. 29.] BALTIMORE, MARCH, 1893. [Price, 15 Cents.

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THE RADICAL CURE OF INGUINAL HERNIA IN THE MALE.[1]

By Wm. S. Halsted, M. D., *Professor of Surgery, Johns Hopkins University, and Surgeon-in-Chief to the Johns Hopkins Hospital.*

Shuh said, "If no other field were offered to the surgeon for his activity than herniotomy, it would be worth while to become a surgeon and to devote an entire life to this service." Quite as well, certainly, might this be said of operations for the radical cure of hernia. There is, perhaps, no operation which has had so much of vital interest to both physician and surgeon as herniotomy, and there is no operation which, by the profession at large, would be more appreciated than a perfectly safe and sure cure for rupture.

Just now, most of the so-called radical-cure operations are under a cloud. They have not withstood the test of time. Modern text-books of surgery refer to operations for the radical cure of hernia with more or less misgiving. The newest American surgery[2] disapproves of operations for the radical cure of reducible hernia if a truss can be worn, and believes that Czerny's method is as good as any, should an operation be necessary.

The most telling blows against radical-cure operations in this country have been dealt, perhaps, by Bull. His papers on the radical cure of hernia and on relapses after the various operations for the radical cure of hernia have produced a profound impression on both practitioners of medicine and practitioners of surgery. Bull concludes the first of these papers[3] as follows: "These observations will, without doubt, be duplicated in the cases yet to be traced, and go to strengthen the conviction that all methods of radical cure will be found unsatisfactory." In his second paper[1] he writes: "I hold, after the knowledge of these failures and in view of the well-established fact that after the old operations for hernia recurrence has been often long delayed, that it is wise to drop the term *cure* and to estimate the value of given procedures by the relative proportion of relapses."

From 1883 to 1885, Bull operated for the cure of hernia chiefly by what he calls Socin's method—ligature and excision of the sac. From 1885 to 1889 he employed what he calls Banks' method—ligature and excision of the sac, with suture of the pillars of the external ring. Since 1889 he has practised the sewing-up of the canal after ligating and excising the sac.

Of the cases operated upon by the first method, at least 27.27 per cent. relapsed within one year; of those operated upon by the second method, at least 40 per cent. relapsed within one year; and of those operated upon by the third method, at least 42 per cent. relapsed within one year.

"My own results," writes Bull, "as to relapse being no better by the complicated method of suture of the ring alone, or of the ring and canal, than by the simpler method of excision of the sac after ligature, I shall confine myself to that method of operation till other procedures which have stood the test of years make a more promising showing." Bull's results became less promising the longer he observed his cases. From a series of one hundred and thirty-six cases there remained only four which had been over four years without

[1] Read at the Annual Meeting of the Medico-Chirurgical Faculty of Maryland, at Easton, Md., Nov. 17th, 1892.

[2] An American Text-book of Surgery. Keen and White.

[3] Bull: On the radical cure of hernia, with results of one hundred and thirty-four operations: Medical News, 1890.

[1] Bull: Notes on cases of hernia which have relapsed after various operations for radical cure.

recurrence. In his second paper Bull says: "Now that ten years have elapsed since the modern radical operations have been in vogue, we ought to hear of, or have presented to us, patients who have been more than five years, at the least, without relapse. We could naturally expect to see such cases occasionally at a special hospital. But there are none such." Notwithstanding these facts, Bull does not advise that operations for the relief of hernia be discontinued, nor does he wish to discontinue efforts to discover more satisfactory methods for its cure. For, of the cases operated upon, almost all were relieved for a time, and some for several years; and of the cases which had relapsed, the majority were more comfortable than they had been before they were operated upon.

These are admirable papers and faithfully depict what is to be expected if a hernia is operated upon by the methods which Bull has employed. To-day, therefore, the majority of surgeons operate for the radical cure of hernia only when the hernia is strangulated or cannot be retained with a truss. A few believe that they have had results good enough to justify their operations upon almost every case which presents itself.

Until the sixteenth century incarcerated hernia was treated only by taxis. If taxis failed, the patient died. An ordinary rupture and stone cutter, Pierre Franco, was the first to relieve incarceration by herniotomy. As pre-eminent among his fellows as Paré was among surgeons, he is one of the most illustrious figures in surgical history. He has described, and probably was the first to conceive both the intraperitoneal and extraperitoneal methods of herniotomy. The following is an extract from his chapter on herniotomy:[1] "When all other means have failed we proceed to operate. One must have a little staff of the thickness of a goose-quill, or somewhat thicker, and round, on one side flat and half round and it must be rounded off at the front end that one may press forward easier. One makes accordingly an incision at the upper part of the scrotum, drawing towards the pubes, and at the outset makes the opening only just large enough to admit the staff, for one must take care that he does not thrust into the intestines. When one has found the hernial sac, one must insinuate the little staff between it and the groin and then push upwards. The flat side of the staff must be up. It would not succeed if the staff were entirely round for the knife would then glide from side to side. When one has pushed the staff far enough, he cuts upon the flat side of it through the flesh of the scrotum and groin so as not to injure the intestines now that he has made a larger opening; there is no danger in making the opening large enough to enable one to replace the intestines the more easily because the sac and the flesh of the belly can then be the more readily stretched, and hence perhaps the intestines be returned the more nearly into their correct position. One must reintroduce them little by little. Should the case occur that they will not go back easily and without great pressure because of too great an accumulation of their contents or on account of inflammation, then one must proceed as follows: one takes the hernial sac and cuts it very delicately upon the nail while one raises the sac with hooks and cuts it through to the intestines; and when one has made an opening large enough to admit the staff one pushes it very gently upwards between the sac and the intestines; at the same time one must push the parts aside so as to see if he is catching the intestines. The intestines, however, are not easily caught because they are homogeneous and smooth. One must accordingly divide the sac upon the staff up to the peritoneum, that is, up to the highest point, namely, to the hole where the intestines begin to descend to the scrotum; but one must make a generous opening into the peritoneum without fear and for the sake of greater safety, just as one does in desperate cases of the kind. One then takes a little piece of fine linen and pushes the intestines gradually back, beginning with those which are higher up towards the peritoneum and which lie nearer to the belly."

The suggestion of Franco to replace the intestines with linen is an excellent one, and for me one of the proofs of his genius. There are to-day many surgeons who have not discovered this device and who labor with the fingers to introduce the slippery intestines. With a piece of gauze one can replace the intestines rapidly and with precision, whereas the manipulation of the intestines with the fingers is often a ludicrous performance. Paré, about the middle of the sixteenth century, gives precise instructions for performing herniotomy. He was probably the first surgeon to prescribe herniotomy for all cases of incarcerated hernia. But it was not until the end of the seventeenth century or beginning of the eighteenth century that the operation, through the efforts of Wiseman, Petit, and Richter, became generally recognized and practised.

From a clinical, anatomical and pathological standpoint the work of Sir Astley Cooper on hernia is undoubtedly the greatest of all, and very little has been added to our knowledge of hernia of all kinds since his book appeared. From his chapter on the operation for inguinal hernia one gets a good idea of the respect which surgeons at the beginning of this century had for arteries. Speaking, for example, of the division of the little external pubic artery, which always crosses the sac near the external abdominal ring, he says: "This circumstance, however, is in no degree alarming to a surgeon who expects it, as the bleeding may be stopped by the vessel being compressed by an assistant, or if the artery is larger than usual, owing to the scrotum being long distended by the disease, the blood may be stopped by a ligature."

Cooper substituted his world-famed herniotome for the bulb-pointed knife, and abolished the use of the hollow director which the disciples of Franco and Paré believed to be indispensable.

Otherwise the technique of herniotomy is to-day precisely that of Franco, the gifted stone and rupture cutter of the sixteenth century, except that in pre-aseptic times he, perhaps wisely, preferred the extraperitoneal[1] to the intraperitoneal method. The actual war which these two methods stirred up among surgeons for more than a century is interesting. On the side of Petit, who after Franco was the great disseminator and defender of the method, we find arrayed from the English,

[1] Lehrbuch der Chirurgie, Bd. iii. Eduard Albert.

[1] Kocher, by the way, has recently devised an extraperitoneal operation for the radical cure of hernia.—(Correspondenzblatt für Schweizer Aerzte, 1892.)

Cooper, Key, Teale, Paget, Liston, Gay, Lawrence, and others; from the Germans, Roser, Shuh, Dummericher, Busch, Baum, and others; from the French, Gosselieu, Chauvet, Le Dentu, and others.

The same objections and the same refutations appear year after year. The inconsistency of those opposed to the extraperitoneal method is remarkable. They were, for example, all of them advocates of the taxis, and would not resort to the cutting operation until the taxis had failed; but objected to the extraperitoneal herniotomy because of the danger of returning unseen the contents of the sac. Richter is the only one to whom it occurred pointedly to inquire why that should be feared at the time of the operation which had not been feared a quarter of an hour earlier when taxis was being performed.

Dieffenbach, the most conspicuous advocate of the intraperitoneal method for inguinal and femoral hernias, permits the extraperitoneal method for umbilical and ventral hernias, because "it lessens the danger of peritonitis."

From Celsus we have reports of operations for the cure of reducible hernias. At that time it was believed that many hernias were accompanied by a rent in the peritoneum. The incision was made down to the hernial contents, and the supposed rent in the abdominal wall was closed by sutures.

Heliodorus gives a most masterly description of an operation for the radical cure of hernia which would be a creditable performance to-day. The directions which he gives for cutting off the sac are unique, and as follows:[1] "We must cut off the hernial sac with great care, for if we take away less than is protruded, the result will be the production of a new hernia, for the edges of the wound will be slack and the way prepared for the slipping out again of the intestines. If one resects more than is protruded by drawing out additional peritoneum from its legitimate resting-place, then the hernia will recur, for the edges of the peritoneum, because of the too great resection, cannot be brought together, and the patient is in danger because normal parts have been taken away. In order, therefore, that we may not miss excising an amount which is precisely correct it is necessary to draw the sac outwards by catching the tip of the same; so soon as the edges of the abdominal wound begin to be everted, enough of the peritoneum has been drawn out and so much is to be excised. If the edges of the abdominal wound have been strongly everted, then one must assume that more peritoneum has been drawn out than is necessary and should pull with less force. When just enough peritoneum has been drawn out the sac is to be twisted. Having been cut off along a straight line, the peritoneum becomes folded upon itself and screwed up and closed so tight that not even the point of a probe can be introduced."

That Heliodorus recognized the existence of the infundibuliform fascia there can be no doubt,[2] for he says that one has not reached the true hernial sac until the last of the layers which enclose together the hernial tumor and the spermatic cord has been divided. With the exception of the torsion of the sac, which we replace with the suture, the operation for the radical cure of hernia in the time of the Roman emperors was quite on a par with the operation as it is usually performed in our day. Four hundred years later the operation had ceased to exist.

I am not inclined to attach much importance to the manner of closing the sac, nor to the level at which it is cut off, nor to the treatment of the sac in general, provided the peritoneum is not allowed to protrude outwards into the wound. With the revival of the operation for the radical cure the testicle was sacrificed. Paul of Aegina directs that the sac be ligated at two places, and that, cutting between the ligatures, the testicle and sac be removed. The Arabians did not advance beyond this method. At length when it occurred to Lanfrancous to attempt to cure hernia without sacrificing the testicle, he believed that the inspiration was from God. In 1882 and 1883 Kraske advised castration in certain difficult cases for the cure of hernia.

Guido von Cauliaco, although not sacrificing the testicle himself, was inclined to excuse others for doing so, because the hernia was less likely to return after the testicle had been removed, and the generating power was not lost. This observation of Guido von Cauliaco is interesting because it implies that in the Middle Ages the cord must have been regarded as the important factor in the production of hernia. From that time to the introduction of antiseptic surgery, methods of all sorts, many of them cruel and some barbarous, have been in vogue. They may be classified as follows:

1. Pressure with or without the simultaneous application of irritating and so-called contracting remedies.
2. Caustics and the actual cautery.
3. Ligature of the sac, with or without cutting it off.
4. Introduction of foreign bodies into the hernial sac.
5. Healing in of a detached portion of skin, or of a portion of impacted skin into the abdominal ring.
6. The injection of irritating fluids within or outside of the hernial sac.
7. The subcutaneous suture.

Some of these methods are interesting as curiosities, and others because they are still practised.

The employment of the actual cautery for the cure of hernia appealed particularly to the knife-dreading Arabian school.[1] After the rupture had been returned and the cord drawn aside, the cautery was applied over the external abdominal ring and kept there until it had burnt through the skin and hernial sac down to the bone. The region of the external abdominal ring having been described by Paul of Aegina as triangular, three different cautery points were sometimes used for this operation—a straight one for the center point, a gamma-shaped one for the sides, and a lens-shaped one for the surface of the triangle. The celebrated filium aureum or punctum aureum, the golden ligature or the golden puncture, was introduced by Geraldus in Metz. The sac was laid bare and then occluded by a golden thread so passed as not to include the spermatic cord.

Wood's subcutaneous suture is still practised in Great Britain, and, according to Bassini, has for years been the favorite method in Italy. I can remember when in New York the

[1] Lehrbuch der Chirurgie, Bd. iii. Eduard Albert.
[2] Albert, l. c.

[1] Albert, l. c.

honors were about equally divided between Wood's method and Heaton's injection method. So late as 1882, J. H. Warren, of Boston, wrote a book in behalf of his injection method, which is essentially the same as Heaton's. The injection of alcohol (Schwalbe) is quite popular in Germany and France.

With the introduction of antiseptic surgery, or rather several years after Lister's first contributions to this subject, Annandale, Steele, Riesel, Nussbaum, and a few others, made bolder attempts to cure ruptures. Although differing from each other in detail, the methods of these surgeons were essentially alike and are embraced under the following heading: Ligature of the exposed neck of the sac, with extirpation or incision of the sac.

We are indebted to antiseptic surgery for reintroducing to us the operation of Heliodorus.

In 1878, Czerny, in his valuable Beiträge zur Chirurgie, records seven cases in which after ligating the neck of the sac and excising the sac he had sutured the pillars of the external abdominal ring. He attributes to Richter the conception of the operation, saying that it was believed by Richter that for the radical cure of hernia not only must the hernial sac be destroyed but also must the ring be narrowed. He courteously concedes also to Billroth, to whom his Beiträge are dedicated, credit for the idea because Billroth had said, "If we could artificially produce tissues of the density and toughness of fascia and tendon, the secret of the radical cure of hernia would be discovered." Some years later, Banks published what he supposed to be a new operation for the radical cure of hernia. Although practically the same as Czerny's, it was for several years known as Banks' operation in this country and in Great Britain.

I am surprised to see that Lauenstein, so recently as 1890, accredits Banks with Czerny's operation. Lauenstein's ideas of Czerny's operation were perhaps obtained from the latter's first publication, and not from his Beiträge zur Chirurgie; for in his Beiträge zur Chirurgie Czerny regrets that he did not remove the sac in his earlier operations. That Banks uses silver wire instead of silk or catgut in sewing together the pillars of the external abdominal ring, and that he possibly cuts off the sac at a higher level than Czerny does, hardly entitles him to the operation. The use in general of powerful sewing materials in surgery is, it seems to me, based on a misapprehension in pathology. If, for example, the tension is so great that wire must be used to bring parts together, one must not expect permanent assistance from the wire; for the tissues will eventually be cut through by the stitches to the extent necessary to relieve the tension.

Czerny had not observed his cases long enough to undeceive him as to the value of his operation, and he expresses himself very cautiously as to its ultimate results. He sets an excellent example for less conscientious surgeons when, agreeing with Schede, he does not propose to operate upon controllable ruptures until the experience of many years with ruptures which cannot be controlled by a truss shall have convinced him of the safety and reliability of his method.

In 1879, Tilanus of Amsterdam collected for the International Medical Congress data from one hundred and twenty-two cases which had been operated upon by what were supposed to be antiseptic methods. Of the ultimate results not enough had been ascertained to enable one to form conclusions. The mortality was 6 per cent, or too great to justify operating upon ruptures which could be comfortably retained by a truss.

The most important contributions since Czerny's to the radical cure of hernia are from McEwen, McBurney, Bassini, Kocher, and Lucas-Championnière. In his own hands, McEwen's operation seems to have been perfect. It is difficult to say upon just what part of the operation its success depends. I am not inclined to ascribe it to the tampon, although Lauenstein testifies that he was fortunate enough to see the anatomical preparation from a patient cured by McEwen's method who for years subsequent to the operation had done heavy work without a truss. The patient died of an aortic aneurism. His inguinal canal was firmly closed, and on the abdominal side of the same and firmly adherent was the sac folded up into a dense cushion, which strengthened the abdominal wall in this situation. Unlikely as this may seem, we must unhesitatingly accept the testimony of such men as Lauenstein and McEwen. Bassini, on the other hand, had an opportunity to observe at an autopsy ninety-five days after the operation, that the tampon which he had made somewhat after the manner of McEwen's had been completely absorbed; not a trace of it remained. One is so familiar with the fate of redundant tissues that it is hard to convince oneself that the tampon remains for years just as it was at the operation, and that even if not entirely absorbed it is not at least greatly reduced in size. The tampon being in place, the first step of McEwen's operation is concluded. The second step is to restore the valve-like form of the inguinal canal. This is done by one or more mattress sutures which unite the conjoined tendon to the aponeurosis of the oblique muscle. The application of these sutures is simple, although from the description it would seem to be complicated.

How much McEwen's wonderfully good results might be attributed to the wearing of trusses would depend upon the percentage of truss-wearers. It is strange that so little success has attended the practice of McEwen's operation in this country. Is the fault with the operator or with McEwen's description of the operation? Whatever the future of this operation may be, McEwen certainly took an advance-step in the treatment of inguinal hernia.

McBurney's operation is undoubtedly so well known to all Americans that a description of it would be superfluous. It would seem to be the most heroic test which is possible of scar-tissue and open-wound treatment. But scar tissue, however thick and dense, is not the tissue best calculated to recover from the effects of blows, or to permanently withstand the constant pressure of the abdominal contents. McBurney has kindly informed me by letter that although the hernia has recurred in some of his cases, the percentage of recurrence is so small that he still practises his method. Bull tabulates several relapses after McBurney's operation. More than three years ago I described a new operation for the cure of inguinal hernia in the male.[1] Six or eight months later, Bassini of Padua published his operation for the cure of inguinal

[1] Bulletin of the Johns Hopkins Hospital, Vol. I, No. 1; Johns Hopkins Hospital Reports, Vol. II, surgical fasciculus, No. I.

hernia which he had performed two hundred and fifty-one times, with only seven returns and no deaths except one, and that from pneumonia after the wound had healed.

Bassini's operation and mine are so nearly identical that I might quote his results in support of my operation. Instead of trying to repair the old canal and the internal abdominal ring, as McEwen had tried to do, I make a new canal and a new ring. The new ring should fit the cord as snugly as possible, and the cord should be as small as possible. The skin incision extends from a point about 5 cm. above and external to the internal abdominal ring to the spine of the pubes. The subcutaneous tissues are divided so as to expose clearly the aponeurosis of the external oblique muscle and the external abdominal ring. The aponeurosis of the external oblique muscle, the internal oblique and transversalis muscles and the transversalis fascia are cut through from the external abdominal ring to a point about 2 cm. above and external to the internal abdominal ring. The vas deferens and the blood-vessels of the cord are isolated. All but one or two of the veins of the cord are excised. The sac is carefully isolated and opened and its contents replaced. A piece of gauze is usually employed to replace and retain the intestines. With the division of the abdominal muscles and the transversalis fascia the so-called neck of the sac vanishes. There is no longer a constriction of the sac. The communication between the sac and the abdominal cavity is sometimes large enough to admit one's hand. The sac having been completely isolated and its contents replaced, the peritoneal cavity is closed by a few fine silk mattress sutures, sometimes by a continuous suture. The sac is cut away close to the sutures. The cord in its reduced form is raised on a hook out of the wound to facilitate the introduction of the six or eight deep mattress sutures, which pass through the aponeurosis of the external oblique and through the internal oblique and transversalis muscles and transversalis fascia on the one side, and through the transversalis fascia and Poupart's ligament and fibers of the aponeurosis of the external oblique muscle on the other.

The two outermost of these deep mattress sutures pass through muscular tissues and the same tissues on both sides of the wound. They are the most important stitches, for the transplanted cord passes out between them. If placed too close together, the circulation of the cord might be imperiled, and if too far apart, the hernia might recur. They should, however, be near enough to each other to grip the cord. The precise point out to which the cord is transplanted depends upon the condition of the muscles at the internal abdominal ring. If in this situation they are thick and firm, and present broad raw surfaces, the cord may be brought out here. But if the muscles are attenuated at this point, and present thin cut edges, the cord is transplanted farther out. The skin wound is brought together by buried skin sutures of very fine silk.[1] The transplanted cord lies on the aponeurosis of the external oblique muscle and is covered by skin only. In both of the patients presented you will feel the cord in this situation distinctly. They were operated upon two and three and one-half years ago.

[1] Instead of the interrupted buried skin suture as shown in Plate III, we now use an uninterrupted buried skin suture without knots, which is withdrawn after two or three weeks.

Bassini believes that he restores the inguinal canal to its physiological condition, inasmuch as he makes "a canal with two openings, an abdominal and a subcutaneous; furthermore with two walls, a posterior and an anterior, through the middle of which the spermatic cord passes obliquely." But the original canal is not by any means an affair so simple as Bassini's. To reproduce the equivalent, anatomically and physiologically, of the inguinal canal is, I believe, impossible. Moreover, we do not know that nature has made the best possible provision against hernia in providing as it does for the passage of the cord through the abdominal wall. Bassini's operation, although essentially the same as my operation, is different in some respects. 1. Bassini always brings the cord through the muscles at the internal abdominal ring. The point out to which I transplant the cord is determined, as I have said, by the condition of the muscles. 2. Bassini does not excise the superfluous veins. I believe that it is advisable to reduce the size of the cord as much as is practicable. 3. In Bassini's operation the cord lies posterior to the aponeurosis of the external oblique muscle; in mine, between this aponeurosis and the skin. To secure for the cord the position which Bassini recommends an additional row of stitches is required. Unless it should be demonstrated by a comparison of the results of the two methods that there is something to be gained by these additional stitches, it would be well for the sake of the wound and the operator to discard them.

Kocher thinks that the methods of Bassini and himself are to be preferred to other methods, McEwen's for example, because they (the former) enable the patient to get out of bed on the eighth day. I fail to see anything in the methods of Kocher and Bassini and myself which might enable the patient to get out of bed earlier than if he had been operated upon by the method of McEwen. The time to be spent in bed depends upon the judgment of the surgeon and not, open methods excluded, upon the particular method. Our patients are kept upon their backs for 21 days. Wounds thoroughly healed throughout per primam are not strong in eight days. One can easily tear open a typically healed wound which is not more than six or seven days old. Not long ago in attempting to restore a club foot to its proper position I accidentally and with very little force pressed wide open a wound which had healed in the typical way and was eight days old.

A wound is certainly stronger on the fourteenth day than it is on the seventh, and stronger on the twenty-first day than on the fourteenth. Just how long wounds of skin and muscle which have healed by first intention may continue to increase in strength we do not know. In our hernia wounds, the subcutaneous ridge of the aponeurosis and muscle which results when the parts have been brought together properly by buried mattress stitches does not disappear entirely for five or six or more weeks. I sometimes question the propriety of allowing, as I do, my patients to walk about on the twenty-first day.

The technique of operations for the radical cure of hernia should be unusually perfect, because we have to violate occasionally what I consider to be one of the most important principles of antiseptic surgery. We have to constrict the tissues somewhat with our deep sutures. It is not always possible to

bring together the pillars of the external abdominal ring without a little tension. One can of course make relaxation cuts, but these would be quite as undesirable as a moderate amount of tension. Our hernia wounds illustrate admirably the danger of constricting tissues. We never resort to drainage of any kind for fresh wounds. And with the exception now and then of a hernia wound, none[1] of our fresh wounds suppurate. Inasmuch as we rarely if ever have occasion to constrict tissues in other fresh wounds, it is almost certain that the occasional stitch abscess in a hernia wound is due to tissue constriction plus, of course, the infection. To provide for a good circulation in every particle of tissue in and immediately about a wound is as much a part of our technique as are the ordinary antiseptic precautions. The better the circulation the less the likelihood of suppuration.[2]

Since the opening of the Johns Hopkins Hospital, 3½ years ago, 82 operations for the radical cure of hernia have been performed, and without a death. 64 of the cases were males, 18 were females. Of the females, four had femoral, 13 inguinal and one umbilical hernia. Of the males, 63 had inguinal and one femoral hernia. Five of the males were operated upon by Dr. Brockway by McBurney's method. Of these five cases two have recurred; two have not been heard from; and one, a boy 2½ years old, is still well, 20 months after the operation. The cord in so young a patient is so very small that the hernia might be cured for several years by almost any method.

My operation, with or without modification, was employed in 58 cases. Of the cases which healed per primam, not one has recurred. The wounds which suppurated were immediately laid wide open and allowed to heal by granulation. For the result in such cases the open method, and not mine, is responsible. There have been six recurrences—Nos. 2, 12, 24, 27, 39, 52. No. 2 took cathartics and got out of bed a few days after the operation. He was discharged for insubordination on the eighth day, before his wound was firm. In No. 12 the cord was not transplanted. In No. 24 a stitch abscess formed several weeks after his discharge. There is a slight impulse, on coughing, at the site of the abscess. In No. 27 the wound suppurated. The stitches were removed and the wound was laid wide open and allowed to heal by granulation. This patient had a diffuse suppurative inflammation of the neck at the time of the operation. No. 39, the wound was opened for hemorrhage and allowed to heal by granulation. No. 53, the wound suppurated, was laid open, and healed by granulation. The patient has a flabby abdominal wall. The scar has stretched throughout its entire length, and there is an impulse all along the scar on coughing.

[1] Not more than one or two in a year. *Vid.* Johns Hopkins Hospital Reports, Vol. 2, surgical fasciculus, No. 1.

[2] I have performed three amputations within a year and a half through tissues which were almost surely infected and with instruments and hands which were as surely infected. No attempt was made to disinfect the wounds except that they were washed with a sterilized salt solution, and in one instance with warm water from the faucet. Great care was exercised in ligating and sewing and dressing to avoid constricting the tissues and to provide against tension. The wounds were closed as usual. They all healed absolutely by first intention.

Statistics of Operations at the Johns Hopkins Hospital for the Radical Cure of Hernia.[1]

1. W. H. R., æt. 8. Large, right, congenital, inguino-scrotal, reducible hernia. Operation, 13, 6, 1889. Healed per primam. Last observation, 1, 6, 1891, the result is still perfect, 2 years after the operation.

2. G. H., æt. 20. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 17, 6, 1889. Healed per primam. Discharged for insubordination, 24, 6, 1889. Patient got out of bed several times and took cathartic pills without permission. 14, 6, 1892, there is a complete return of the hernia.

3. J. B., æt. 48. Very large, right, oblique, inguino-scrotal, reducible hernia. Operation, 16, 8, 1889. The bladder was caught in one of the stitches, and the wound, consequently, was laid open and allowed to heal by granulation. Last observation, 10, 3, 1892, the hernia has not returned, 2½ years after the operation.

4. M. E. L., æt. 14. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 19, 8, 1889. Last observation, 21, 3, 1892, the hernia has not returned, 2½ years after the operation.

5. J. D., æt. 8. Small, left, oblique, inguinal, reducible hernia. Operation, 9, 10, 1889. Healed per primam. Last observation, 5, 3, 1892, result still perfect, 2 years and 5 months after the operation.

6. C. I. B., æt. 38. Small, left, femoral, reducible hernia. Operation, 11, 10, 1889. Healed per primam. Discharged, 4, 11, 1889.

7. F. F., æt. 7. Small, right, congenital, inguinal, reducible hernia. Operation, 12, 10, 1889. Healed per primam. Last observation, 25, 3, 1892, result still perfect, 2 years, 5 months after the operation.

8. J. W. F., æt. 12. Left, oblique, inguinal, reducible hernia. Operation, 21, 12, 1889. Healed per primam. Last observation, 30, 1, 1890, result still perfect. 1, 3, 1892, patient cannot be found.

9. S. McN., æt. 46. Large, right, femoral, strangulated hernia. Operation, 31, 12, 1890. Discharged, 2, 2, 1891. Result unknown.

10. L. L., æt. 27. Small, right, oblique, inguinal, reducible hernia. Operation, 14, 2, 1890. Open wound. 21, 3, .892, the hernia has not returned.

11. H. S., æt. 37. Large, right, inguinal, reducible hernia. Operation, 21, 2, 1890. Healed per primam. Last observation, 1, 12, 1892, linear scar, result still perfect, nearly three years after the operation.

12. G. G., æt. 28. Large, left, oblique, inguino-scrotal, irreducible hernia. Operation, 2, 5, 1890. Cord not transplanted. Healed per primam. 14, 10, 1890, the hernia has recurred.

13. J. H., æt. 39. Small, left, direct, inguinal, reducible hernia. Operation, 20, 5, 1889. Healed per primam. Last observation, 21, 6, 1890, the hernia has not recurred.

14. E. H., æt. 35. Small, left, femoral, strangulated hernia. Operation, 17, 5, 1890. Discharged, 22, 6, 1890. Result unknown.

15. E. P., æt. 45. Small, right, oblique, inguinal, reducible hernia. Operation, 29, 5, 1890. Healed per primam. Last observation, 16, 6, 1890, the hernia has not recurred.

16. H. B., æt. 8. Small, right, inguinal, reducible hernia. McBurney's operation, 17, 7, 1890. Not heard from since discharged, 23, 8, 1890.

17. H. D., æt. 2½. Right, inguino-scrotal, congenital, reducible hernia. McBurney's operation, 17, 7, 1890. Last observation, 1, 3, 1892, the hernia has not recurred.

18. A. E., æt. 5. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 23, 7, 1890. 24, 11, 1890, the hernia has recurred.

19. G. W., æt. 45. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 23, 5, 1890. Not heard from since discharged, 8, 9, 1890.

[1] A few cases have been added to this list since the reading of the paper.

20. K. F., æt. 11. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 4, 8, 1890. Last observation, 27, 3, 1892, the hernia has not recurred.

21. E. W., æt. 5. Small, left, oblique, inguinal, reducible hernia. McBurney's operation, 11, 8, 1890. 11, 11, 1890, the hernia has recurred. Patient wears truss.

22. D. H., æt. 9. Small, left, oblique, inguinal, reducible hernia. Operation, 23, 8, 1890. Healed per primam. Last observation, 23, 3, 1892, linear scar, result still perfect.

23. T. Y., æt. 52. Large, right, oblique, inguinal, irreducible hernia. Operation, 17, 9, 1890. The adhesions were too firm and too extensive to admit of the reduction of the hernia.

24. J. C. H., æt. 27. Large, left, oblique, inguinal, reducible hernia. Operation, 24, 9, 1890. Healed per primam. Last observation, 15, 11, 1892. A few weeks after the patient had left the hospital a small abscess formed about one of the stitches. Just at this spot there is a distinct impulse on coughing.

25. G. S., æt. 49. Large, left, oblique, inguino-scrotal, irreducible hernia. Operation, 27, 9, 1890. The operation was a difficult one and consumed two hours. Stitch abscess, 1, 3, 1892. Patient cannot be found.

26. C. M., æt. 4. Large, right, inguinal, congenital, reducible hernia. Operation, 7, 10, 1890. Healed per primam. 1, 3, 1892, patient cannot be found.

27. M. C., æt. 20. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 26, 11, 1890. Healed per primam. The wound had been healed nearly three weeks when an abscess formed about the outermost stitch. This might be accounted for by the fact that the patient had at the time an acute purulent inflammation of the neck. Last observation, 5, 6, 1892, the hernia is beginning to recur.

28. W. McS., æt. 3. Large, right, oblique, inguinal, strangulated hernia. Operation, 10, 11, 1890. Healed per primam. Last observation, 25, 3, 1892, firm linear scar, result still perfect.

29. E. L. P., æt. 7. Small, right, oblique, inguinal, reducible hernia. Operation, 21, 11, 1890. Healed per primam, except for a small stitch abscess. Last observation, 20, 3, 1892, linear scar, perfect result.

30. A. M., æt. 15. Left, oblique, inguinal, reducible hernia. Operation, 24, 11, 1890. Healed per primam. Last observation, 28, 3, 1892, linear scar, perfect result.

31. S. P., æt. 30. Small, right, direct, inguinal, reducible hernia. Operation, 29, 1, 1891. Healed per primam. Last observation, 2, 4, 1892, linear scar, perfect result.

32. F. H., æt. 40. Small, right, oblique, inguinal, reducible hernia. Operation, 28, 1, 1890. Healed per primam. Last observation, 30, 3, 1891, linear scar, perfect result.

33. J. W., æt. 28. Small, right, oblique, inguinal, reducible hernia. Operation, 23, 1, 1891. Healed per primam. 1, 6, 1892, cannot be found.

34. F. S., æt. 27. Small, left, oblique, inguinal, reducible hernia. Operation, 6, 2, 1891. Healed per primam, except for minute stitch abscess. Last observation, 2, 3, 1891, linear scar.

35. J. L., æt. 14. Small, left, oblique, inguinal, reducible hernia. Operation, 20, 2, 1891. Wound suppurated. Last observation, 1, 3, 1892, hernia has not recurred.

36. J. T., æt. 47. Small, right, oblique, inguinal, reducible hernia. Operation, 24, 2, 1891. Healed per primam. Last observation, 15, 11, 1892, linear scar, perfect result.

37. P. J., æt. 6. Small, left, oblique, inguinal, reducible hernia. Operation, 17, 3, 1891. Healed per primam. Last observation, 14, 4, 1891, result still perfect.

38. E. K., æt. 27. Small, left, direct, inguinal, reducible hernia. Operation, 13, 3, 1891, open wound. Last observation, 21, 3, 1892, the hernia has not recurred.

39. E. J. C., æt. 23. Small, right, oblique, inguinal, irreducible hernia. Operation, 5, 6, 1891, the wound was opened completely for hemorrhage. Healed by granulation. 2, 4, 1892, the hernia has recurred.

40. M. P., æt. 35. Left, oblique, inguinal, reducible hernia. Operation, 8, 5, 1891. Stitch abscess. 1, 6, 1892, patient cannot be found.

41. F. S., æt. 14 months. Small, right, inguino-scrotal, congenital, reducible hernia. Operation, 19, 5, 1891. Healed per primam. 1, 6, 1892, patient cannot be found.

42. J. K., æt. 4. Right, oblique, inguino-scrotal, reducible hernia. Operation, 26, 6, 1891. Wound suppurated. Last observation, 5, 4, 1892, the hernia has not recurred.

43. F. D., æt. 49. Small, right, oblique, inguinal, reducible hernia. Operation, 26, 6, 1891. Stitch abscess. Last observation, 3, 4, 1892, the hernia has not recurred.

44. P. H., æt. 5. Left, oblique, inguinal, irreducible hernia. Operation, 11, 9, 1891. 2, 10, 1891, stitch abscess. 1, 3, 1892, patient cannot be found.

45. P. C., æt. 28. Small, right, direct, inguinal, reducible hernia. Operation, 16, 7, 1891. Wound healed per primam. 23, 3, 1892, patient cannot be found.

46. W. G. W., æt. 2½. Small, right, inguino-scrotal, congenital, reducible hernia. Operation, 25, 7, 1891. Wound healed per primam. Last observation, 1, 4, 1892, linear scar, perfect result.

47. G. B., æt. 22. Right, oblique, inguino-scrotal, reducible hernia. Operation, 4, 8, 1891. Wound healed per primam. Last observation, 1, 7, 1892, linear scar, perfect result.

48. A. McI., æt. 26. Right, oblique, inguino-scrotal, strangulated hernia. Operation, 8, 9, 1891. Wound suppurated. Last observation, 1, 3, 1892, the hernia has not recurred.

49. M. W., æt. 11. Right, inguino-scrotal, congenital, reducible hernia. Operation, 27, 8, 1891. Wound healed per primam. Last observation, 1, 11, 1891, the hernia has not recurred.

50. G. B., æt. 3. Small, right, oblique, inguinal, reducible hernia. Operation, 30, 9, 1891. Wound healed per primam. Ultimate result unknown.

51. J. W. B., æt. 5. Small, left, oblique, inguinal, reducible hernia. Operation, 9, 10, 1891. Stitch abscess. Last observation, 3, 3, 1892, the hernia has not recurred.

52. H. P., æt. 20. Small, right, oblique, inguinal, irreducible hernia. Operation, 9, 10, 1891. Wound suppurated. Healed by granulation. Last observation, 20, 3, 1892, the scar has stretched throughout its entire length. Truss advised.

53. E. L. B., æt. 28. Small, right, oblique, inguinal, reducible hernia. Operation, 3, 12, 1891. Wound healed per primam. Last observation, 7, 4, 1892, linear scar, perfect result.

54. A. M., æt. 4. Small, right, oblique, inguinal, strangulated hernia. Operation, 25, 11, 1891. Stitch abscess. Last observation, 6, 4, 1892, the hernia has not recurred.

55. H. B., æt. 21. Small, left, oblique, inguinal, reducible hernia. Operation, 10, 12, 1891. Stitch abscess. 1, 6, 1892, patient cannot be found.

56. H. R., æt. 20. Small, right, oblique, inguinal, irreducible hernia. Patient's hernia has been once unsuccessfully operated upon by another surgeon. Operation, 8, 1, 1892. Wound healed per primam. Last observation, 3, 1, 1893, linear scar, perfect result.

57. H. H., æt. 2. Small, right, oblique, inguinal, reducible hernia. Operation, 12, 2, 1892. Wound healed per primam. 1, 3, 1892, patient cannot be found.

58. A. F., æt. 30. Very large, left, oblique, inguino-scrotal, reducible hernia. Operation, 23, 2, 1892. Wound healed per primam. 1, 3, 1892, patient cannot be found.

59. K. H., æt. 30. Large, left, oblique, inguino-scrotal, reducible hernia. Operation, 4, 3, 1892. Wound healed per primam. A drop or two of pus about one stitch. 1, 3, 1893, patient cannot be found.

60. C. S., æt. 28. Small, right, oblique, inguinal, irreducible hernia. Operation, 11, 3, 1892. The wound healed per primam. 1, 6, 1892, patient cannot be found.

61. J. S. L., æt. 47. Large, left, oblique, inguino-scrotal, reducible hernia. Operation, 22, 4, 1892. Stitch abscess. 1, 3, 1892, patient cannot be found.

62. J. F., æt. 38. Very large, right, oblique, inguino-scrotal, strangulated hernia. Operation, 12, 5, 1892. The wound healed per primam. Patient had parotid abscess on both sides. Last observation, 22, 6, 1892, linear scar.

63. C. C., æt. 16. Small, left, oblique, inguinal, reducible hernia. Operation, 27, 5, 1892. The wound healed per primam. Last observation, 27, 6, 1892, linear scar.

64. M. W., æt. 45. Large, left, oblique, inguinal, strangulated hernia. Operation, 22, 5, 1892. Wound healed per primam. Last observation, 1, 9, 1892, linear scar, the hernia has not recurred.

65. T. M., æt. 33. Very large, direct, inguino-scrotal, traumatic, strangulated hernia. Operation, 24, 5, 1892. A gangrenous appendix vermiformis was excised. The wound suppurated. The patient was discharged, 2, 7, 1892, and cannot now be found.

66. T. McC., æt. 9. Small, left, oblique, inguinal, congenital, irreducible hernia. Operation, 27, 5, 1892. The wound healed per primam. Last observation, 23, 6, 1892, linear scar.

67. E. C., æt. 23. Right, oblique, inguinal, reducible hernia. Operation, 9, 6, 1892. The wound suppurated. Discharged, 4, 7, 1892.

68. J. McN., æt. 34. Large, right, oblique, inguino-scrotal, irreducible hernia. Operation, 10, 6, 1892. The wound healed per primam. Discharged for insolence, 25, 6, 1892. Last observation, 20, 2, 1893, linear scar, perfect result.

69. G. B., æt. 3. Small, left, oblique, inguinal, reducible hernia. Operation, 15, 6, 1892. The wound healed per primam except for a minute stitch abscess. Discharged, 7, 3, 1892.

70. J. N. W., æt. 21. Small, left, oblique, inguinal, reducible hernia. Operation, 16, 6, 1892. Wound healed per primam. Last observation, 1, 9, 1892, linear scar, perfect result.

71. C. S., æt. 58. Small, right, oblique, inguinal, irreducible hernia. Operation, 23, 6, 1892. The wound healed per primam. Discharged, 23, 7, 1892.

72. M. W., aet. 45. Small, right, oblique, inguinal, reducible hernia. Operation, 5, 7, 1892. The wound healed per primam. Last observation, 1, 9, 1892, linear scar.

73. H. R., æt. 25. Very large, right, oblique, inguino-scrotal, irreducible hernia. Operation, 9, 8, 1892. The wound healed per primam except for slight suppuration about one stitch. Discharged, 8, 9, 1892, well.

74. G. S., æt. 52. Small, left, oblique, inguinal, reducible hernia. Operation, 1, 9, 1892. The wound healed per primam. Discharged, 5, 10, 1892, well.

75. A. B., æt. 25. Left, oblique, inguinal, strangulated hernia. Operation, 6, 10, 1892. The wound healed per primam. Discharged, 1, 11, 1892.

76. W. K. H., æt. 43. Small, left, oblique, inguinal, reducible hernia. Operation, 29, 11, 1892. The wound healed per primam. Discharged, 27, 12, 1892.

77. C. C., æt. 22. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 13, 12, 1892. The wound healed per primam. Discharged, 18, 1, 1893.

78. A. E., æt. 5. Small, right, oblique, inguinal, reducible hernia. A recurrence after McBurney's operation in four months. Operation, 5, 12, 1890. The wound healed per primam. Last observation, 6, 4, 1892, the hernia has not recurred.

79. C. M. S., æt. 50. Large, right, femoral, strangulated hernia. Operation, 25, 12, 1892. Typical healing.

80. B. D., æt. 22. Large, left, oblique, inguinal, reducible hernia. Operation, 13, 1, 1893. Typical healing.

81. J. G., æt. 59. Very large, right, oblique, inguinal, reducible hernia. Operation, 10, 1, 1893. The wound healed per primam.

82. M. L., æt. 2. Large, right, oblique, inguinal, strangulated hernia. Operation, 29, 1, 1893. Typical healing.

The time has come when one may operate upon almost every case of hernia not only without danger to the patient, but also with an almost certain prospect of success. Those who with Bull have dropped the term "cure" may take it up again. That the mortality is practically nothing one may convince himself from the latest statistics.

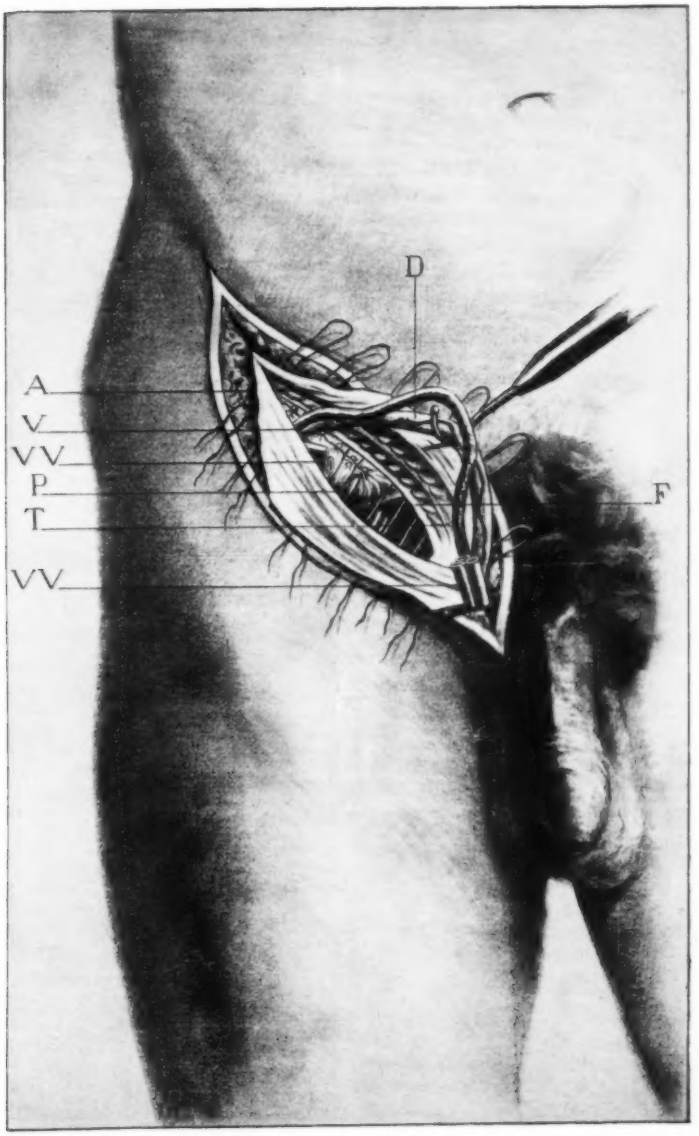
Svensson and Edman had from 106 cases one death from enteritis and nephritis on the tenth day when the wound was perfectly healed. McEwen operated 98 times for the cure of inguinal hernia, from 1879 to 1890. The only fatal case was that of a boy three years old who contracted scarlet fever after the operation and died within thirty-six hours. Bassini has operated 251 times for non-strangulated hernia by his method, with but one death, and this from pneumonia 15 days after the operation. The wound in the fatal case had healed per primam. Lucas-Championnière from 111 cases lost one from pneumonia. Kocher reports 119 operations for the radical cure of hernia with one death. The cause of death was pulmonary embolism 15 days after the operation and when the wound was perfectly healed. We have operated 82 times for the radical cure of hernia without a death.

If it is objected that had it not been for the operation none of the deaths above enumerated would have occurred, we cannot positively deny it. But it is not improbable, as Kocher cleverly remarks, that if one should keep under observation hundreds of hernia cases of all ages and classes and present them every day with a good dinner, he would occasionally be able to announce a death among them. As to the ultimate results I shall refer only to those of McEwen, Bassini and myself. McEwen failed but once in 98 cases, and has had several cases under observation for ten years or longer. Bassini failed but seven times in 251 cases: one hundred and eight cases had been cured for from one to 4½ years, 33 from one year to six months, and 98 from six months to one month. In only four cases was the result unknown. It is now nearly four years that I have been operating for the cure of inguinal hernia in the manner just described by me, and thus far I have no failure to record, if we exclude the recurrences which I have reported and which could not be ascribed to my method.

Explanation of the Plates.

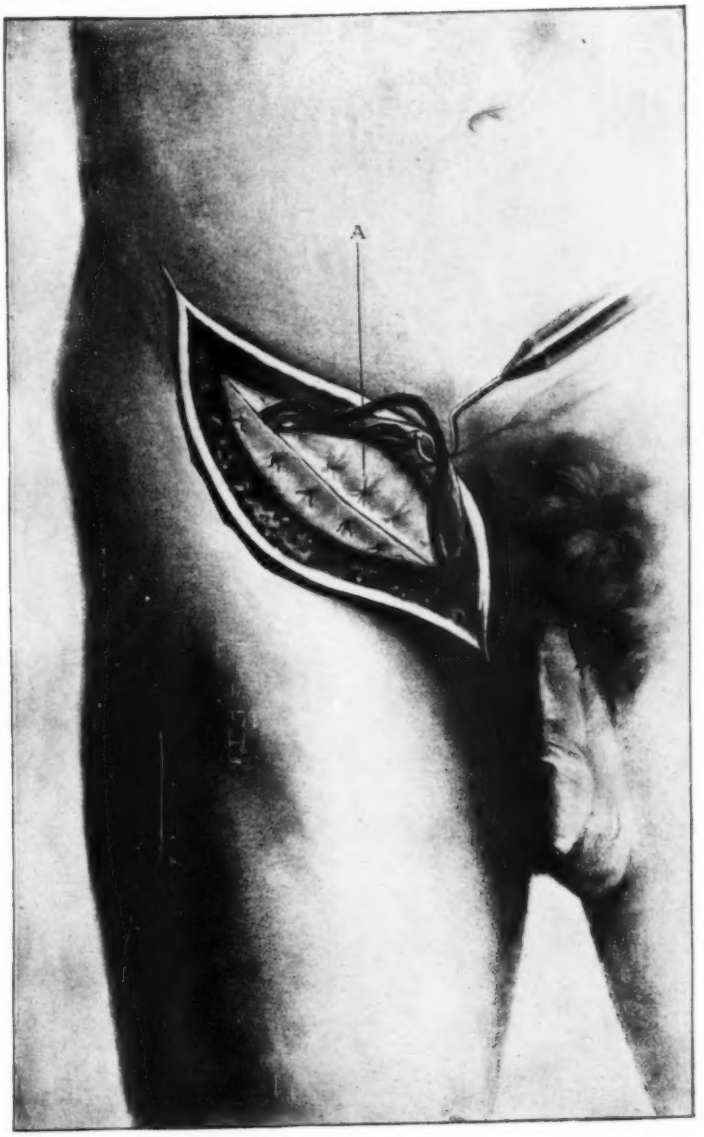
A, Aponeurosis of the external oblique muscle.
D, Vas deferens.
F, Fascia transversalis.
P, Peritoneum.
S, Buried skin-stitch, tied.
S', Buried skin-stitch, introduced but not tied.
T, Conjoined tendon.
V, Vein.
V, *V*, Stumps of excised veins.

PLATE I.



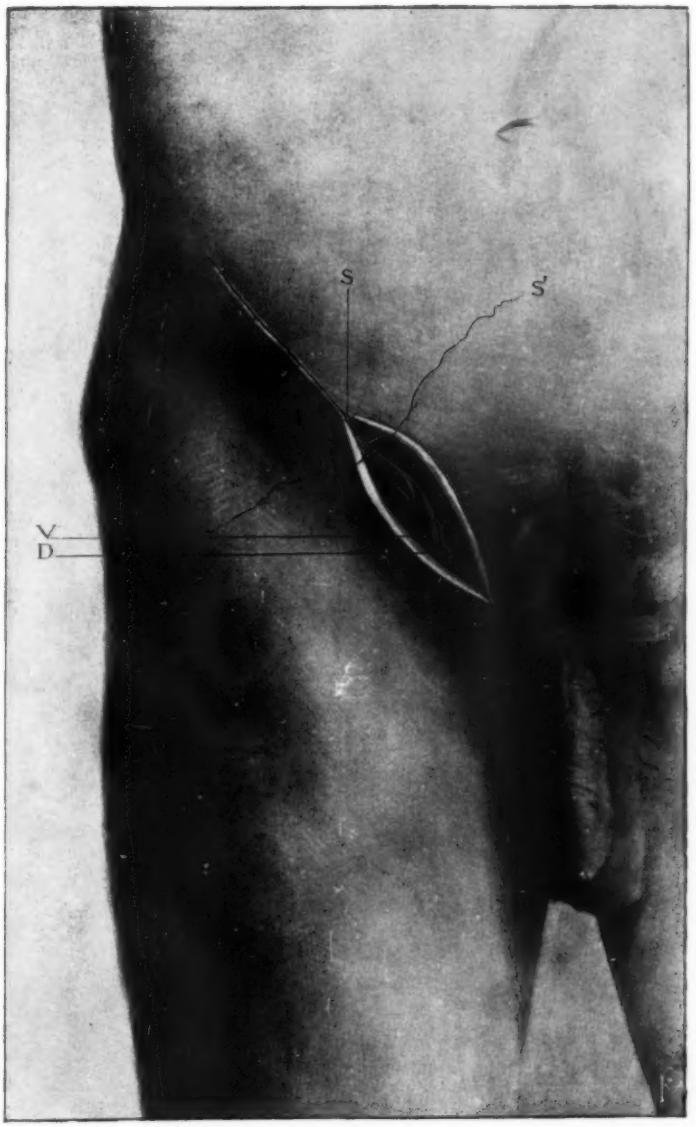
To illustrate Dr. Halsted's article.

PLATE II.



To illustrate Dr. Halsted's article.

PLATE III.



To illustrate Dr. Halsted's article.

TWO CASES OF HÆMATURIA WITH CATHETERIZATION OF URETERS AND EXPLORATORY NEPHROTOMY.

By Albert L. Stavely, M. D., *Resident Gynecologist to the Johns Hopkins Hospital.*

I wish to report two cases demonstrating the value of the ureteral catheter as an aid in the differential diagnosis of diseases of the kidneys and bladder. In both of the patients the important symptom was a persistent, weakening hæmaturia. The first case, Mrs. S., æt. 39, from North Carolina, was admitted to the gynecological ward, May 5, 1892. She had been married seventeen years and was the mother of five children, the oldest sixteen and the youngest five years of age. Two months after the birth of the last child she observed that her urine was deeply stained with blood and contained clots. This lasted but a day, and she had no discomfort except from an old backache. For six months after this the urine remained clear. At the end of that time it again became discolored with blood, remaining so for one day. After that, attacks of hæmaturia recurred with greater frequency, and persisted a longer time, until a year before her admission to the Hospital, when they appeared every two weeks and lasted a week on each occasion. For the five weeks prior to her admission here she had constant hæmaturia. Her bladder had by this time become very irritable, causing her to void her urine with great frequency. The menstrual history has no significance. For a few months she had a slight cough, and pain in the right side of the chest. A few days before coming to Baltimore she expectorated a few clots of bright-colored blood and mucus streaked with blood. She has had malarial fever, but not recently. Her mother and one sister died of phthisis.

On admission her condition was as follows: well nourished, but extremely anæmic, appetite good, free from dyspepsia, bowels regular, hæmorrhoids and a slight prolapsus of the rectum, aching in the left lumbar region, pain over the left ovary, headache, slight œdema of the feet, frequent micturition, occurring every two hours, unaccompanied by burning; temperature and pulse normal. Examination of the lungs revealed dullness over the right apex, somewhat harsh breathing, and a few moist rales. Heart negative. Kidneys could not be palpated. The uterus was bound down in retroflexion, and the left ovary enveloped in adhesions. These were broken up by bi-manual manipulation. The blood and urine were carefully examined by Dr. Cullen on May 6. The blood count gave 3,172,000 red corpuscles and 10,000 leucocytes to the cubic millimeter, and the hæmoglobinometer 45 per cent of hæmoglobin. A specimen of urine in a good state of preservation, examined two hours after passing, showed 110,000 red blood corpuscles to the cubic millimeter. Taking 110,000 red blood corpuscles as the standard, she passed over 17 cubic centimeters of blood in 24 hours. This of course is but a rough estimate, but shows at least the minimum amount of blood lost. The actual quantity may have been greatly in excess of the estimate. On the 8th, amorphous urates and flat epithelial cells were found in addition to the blood elements. The urine was examined for tubercle bacilli with a negative result.

To determine the source of the hemorrhage the bladder was examined and found clear, after which the left ureter was catheterized by Dr. Kelly. Four and one-half minutes after the introduction of the catheter the urine appeared at the end of the catheter and began discharging drop by drop. Ten minims of a reddish-yellow urine were collected in this way in five minutes. This urine was acid, containing a large number of red blood corpuscles, some leucocytes, a few amorphous urates and ureteral cells in groups and singly. On the 15th the left ureter was again catheterized. The urine which escaped was tinged red, was turbid and contained red blood corpuscles. An attempt was made to catheterize the right ureter, but the catheter could not be engaged in the orifice. The urethra was then incised and an exploratory finger inserted after Simon's method. A roughening around the orifice of the right ureter, suggestive of ulceration, was detected.

A third examination was made on May 25th, when an incision was made in the base of the bladder and the right ureteral orifice exposed and catheterized, the catheter being introduced up to the pelvis of the kidney. The bladder was inspected and found healthy, and the roughening proved not to be ulceration. The urine drawn from the right kidney contained a trace of blood, in marked contrast to the opposite side. The wound in the bladder was at once closed with eleven silkworm sutures, and the patient then placed on her right side in the position for lumbar nephrotomy. A vertical incision was made in the left lumbar region close to the quadratus muscle, and the kidney elevated, brought out of the incision and examined. An area of doubtful fluctuation was detected along the free border extending down into the pelvis of the kidney. A careful inspection of the renal substance as well as of the pelvis of the kidney revealed no disease. The bleeding was free throughout. The incision in the kidney was then closed by interrupted catgut, and the external wound by silkworm gut and silk sutures. Following the operation she had incontinence of urine for four days, due to the stretching of the urethra.

On the second day, May 26th, the temperature was 100°, pulse 140. On the 27th the urine was bright red, alkaline, and contained abundance of leucocytes and red blood corpuscles. On the fourth day, 28th, she had a severe chill, with a temperature of 104°, followed by profuse sweating. On the 29th the urine was reddish-yellow, contained numerous red blood corpuscles and leucocytes, and a few blood clots. On June 12th her condition was excellent and she was allowed to sit up. On June 22d, a month after the operation, she was discharged well. The urine was clear and had been so for two weeks.

Several weeks after her return home she is reported to have had a slight temporary return of the hæmaturia.

The second case, Mrs. G., from Maryland, was admitted November 1, 1892, married seventeen years. 1 child, æt. 9; four abortions, last one two years ago. She has had palpitation of

the heart, severe pains in the cardiac area, occasional severe headache, considerable nausea and poor appetite. When a child she had pleurisy, and nine years ago had dysentery followed by chills and fever. She was well nourished, but very anæmic.

Family history negative. A year ago she developed hæmaturia, and had it without interruption up to the time of admission. It appeared suddenly, was accompanied by no bad symptoms, and became worse the longer it lasted. Besides the gradual increase in the quantity of blood passed, she noticed occasional very perceptible exacerbations. Physical examination of chest negative. Examination per vaginam showed marked relaxation of outlet and sagging of the uterus.

The urine was examined the day after admission. Color was dark red, specific gravity 1020, reaction slightly acid. There was a large quantity of albumen and a heavy, dark red, uncoagulated sediment. Under the microscope numerous red blood corpuscles were found, a few leucocytes and a few large, flat epithelial cells, but no casts. On the fourth of November both ureters were catheterized simultaneously by Dr. Kelly.

Before the catheterization the bladder was emptied and then distended with a weak solution of methylene-blue, demonstrating whether or not the urine escaping through the ureteral catheter was contaminated by the fluid in the bladder. In 14 minutes 20 minims of dark, bloody urine were obtained from the left kidney. On pressure over the kidney the urine could be made to flow more freely. Microscopically it was found to be loaded with red blood corpuscles, most of them in a good state of preservation, a few leucocytes and large epithelial cells, and a few scattered groups of small, round epithelial cells about twice the size of a red blood corpuscle. The cell protoplasm was granular and no nuclei could be seen. Reaction slightly acid. From the right kidney 10 minims were obtained in 14 minutes. This urine was of a clear amber color. Under the microscope several epithelial cells were seen, free and in groups, most of them small and round, with indistinct nuclei, a few small and spindle-shaped. Reaction strongly acid. No albumen on testing with HNO_3. On mixing the urine of the left kidney with an equal amount of clear urine, the color was identical with that discharged from the bladder.

This examination proved beyond a doubt that the blood came entirely from the left kidney, upon which an exploratory nephrotomy was performed on November 9th by Dr. Kelly, with the patient in the Sims position. An incision 8 cm. long was made in the left lumbar region, extending from the twelfth rib to the crest of the ileum, slightly oblique. The kidney was lifted up through the opening outside the body, and while digital pressure was made on the renal vessels controlling the circulation, a free incision was made along the back of the kidney, extending two-thirds of its length and down to the pelvis. The pelvis and all other parts of the kidney were carefully examined and no evidence of any disease found. A piece was then removed for microscopic examination and the wound closed with interrupted catgut sutures and the organ returned. The substance of the kidney was very friable and the sutures showed a marked tendency to cut through. A small strip of gauze was inserted for drainage, and the lower angle of the wound closed with silkworm gut sutures.

Duration of operation, 35 minutes. For a few days she complained of severe pain in the left renal region. The drain was removed on the second day and the stitches on the eighth.

On the day following the operation the urine presented this condition: color reddish-black, specific gravity 1025, reaction neutral, albumen excessive, heavy, reddish-black sediment, blood elements greatly increased, hyaline and blood casts and renal epithelium.

On the fourth day the color was reddish-yellow, specific gravity 1018, reaction acid, amount of albumen small. Red blood corpuscles greatly diminished, leucocytes increased, granular and epithelial casts. On the eighth day casts had disappeared, and red blood corpuscles much less numerous. On the twelfth day the urine was straw-colored and translucent, having specific gravity of 1016, acid reaction, a small amount of albumen, and a thin sediment which consisted of pus. On the fifteenth day it was perfectly clear, had specific gravity of 1016, contained only a trace of albumen and a few pus cells.

On her discharge four days later a final examination was made, and the red blood corpuscles were still absent. She was heard from two weeks after leaving the Hospital, and the urine was still free from blood.

The report of the microscopical examination of the section of kidney, as made by Dr. Flexner, is as follows: "The section of kidney passes through a part of the cortex only. Just beneath the capsule the tubes are a little atrophied, and a number of fibroblasts are visible in such places. Around some few glomeruli the capsule of Bowman is thickened slightly, and these glomeruli are correspondingly atrophied. In such areas there is an increased number of fibroblasts between the tubes. The epithelium of the convoluted tubules is granular, swollen and somewhat broken up. A few epithelial cells are found, in which the nuclei are absent. A few hyaline casts (3) were found in the collecting tubules of the cortex. No blood in the tubules seen in the sections."

In both of these cases the etiology was and still remains obscure, in spite of the fact that the disease was localized in one kidney, and in spite of careful inspection and a deep incision into the kidney. In both cases disease of the urethra and bladder was excluded, and the kidneys alone must be considered the sources of hemorrhage, after such convincing evidence as was afforded by the introduction of the ureteral catheter. The incision of the kidney and the careful palpation by the finger are sufficient to exclude anything in the shape of calculus or neoplasm.

There was no reason to suspect acute Bright's in either case, and the symptoms would not bear out any such diagnosis. Neither had had any acute fever, and neither had been subjected to the influence of any toxic agent.

It would be safe, I think, to exclude the parasitic origin of hæmaturia, as it is practically unknown in this climate. In the first patient one thing suggests itself, and that is tuberculosis. The patient gives a history of involvement of the apex of the right lung. The urine was examined for bacilli, but none were found. The appearance of the kidney did not suggest tuberculosis, nor is it probable that the mere incision of the kidney would put a stop even temporarily to such a subtle process. In the second patient there was a remote history of malaria, but she had had no malarial manifestations for a number of years. In malaria the attacks are paroxysmal; here it existed for a year without intermission.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of January 16, 1893.

Aneurism of the Dorsalis Pedis.—Dr. FINNEY.

The first case I shall show is one of aneurism of the dorsalis pedis artery, a rather unusual situation. The patient's family history throws no light on the subject. His personal history is as follows: He is an oysterman. Has had small-pox, and, about six years ago, a chancre, followed two weeks later by an eruption on his body. For this he took medicine, prescribed by his physician, for a few weeks, then stopped and has had no further trouble. He entered the Hospital Dec. 6th, complaining of a "boil" on his foot which he came to have opened.

In the latter part of August he had sprained his left ankle quite severely. For two or three days he was unable to put his foot to the ground, but soon went to work again, although his ankle continued to trouble him more or less and was still a little swollen. About a month later, the latter part of September, while following a cart over rough ground, his foot was caught between the wheel and some projecting object. His ankle at this time had not entirely recovered from his previous injury, and the soreness was considerably aggravated. Five or six days later, about the first of October, he started down the bay on an oystering trip, and was gone about two weeks. He was obliged to use his foot a good deal, and it was then that he first noticed a small circumscribed swelling at the point where the enlargement was present when he entered the Hospital. This was very small at first, but continued to enlarge steadily. When questioned, he said that he had noticed a throbbing in the swelling, but this does not appear to have particularly attracted his attention. A week or two after leaving the oyster-boat he had to give up work entirely, on account of the pain in his ankle, and for the last four weeks he has been unable to get about except on crutches. The note made upon entrance is as follows: "On dorsum of left foot in front of ankle joint is a tumor about the size of an egg, presenting a smooth, rounded outline and approximately ovoid in shape. Pulsation seen even at some distance: seems to be expansile in character, and in rhythm corresponds with the patient's pulse."

On palpation there was to be felt a pulsation synchronous with the heart's beat, and with the stethoscope a distinct bruit could be heard. The diagnosis of aneurism was made, and it was thought best to excise it. On December 8th the operation was performed under ether. An incision was made, about 13 cm. long, over the tumor and over the course of the anterior tibial artery. The artery was tied about 3 cm. above the tumor. Pulsation still remained after the anterior tibial had been tied. The dorsalis pedis was next ligated below the aneurism, and still a faint pulsation persisted. After some further dissection, a rather large anastomosing branch was found coming off from the outer side of the sac. This was tied, and pulsation ceased. The sac was then carefully dissected out until the deepest portion was reached, and here the adhesions were so dense that, in attempting to separate them, the sac was torn. It was then observed that the interior of the aneurismal sac communicated with the ankle joint. I could not determine whether I opened the joint or whether it had been already opened, as the membrane was so very thin it was impossible to handle it without tearing. The astragalo-scaphoid joint had been opened and a portion of the clot was found between the articulating surfaces of the bones. The upper surfaces of these bones were eroded to a depth of half a centimeter and over a surface about as large as a silver quarter. The cartilages remained intact and projected into the sac. The amount of erosion was quite extensive, considering the short duration of the aneurism. The sac was removed entire, the wound closed tightly without drainage, according to our custom, and although both of the joints had been opened he made a prompt and satisfactory recovery. He now walks without the aid of a cane, and the motion in the ankle is very good. The pathological examination made by Dr. Flexner is as follows: "Aneurism of the dorsalis pedis artery springing from the posterior aspect of the vessel. Proximal and distal ends of the artery present, and the space between them from which the aneurism springs measures 1 cm. There is a very little patchy endarteritis in the distal end of the artery, and in the anterior tibial at its termination, 1.5 cm. of this having been removed. Aneurism is filled with laminated fibrin and fresh clots."

Excision was done in this case because it is thought best to practise that method of treatment wherever feasible, as it gives the most satisfactory results.

Recurrent Volvulus.—Dr. FINNEY.

This is the second visit of this patient to the Hospital for the same trouble. His first visit was on January 9, 1890, the following account of which is condensed from the Hospital records: "His family history has no bearing on the case. His history previous to entrance was that one week before admission, while on the street, he was taken with severe cramps in the abdomen, with a constant desire to go to stool, but passed nothing but mucus, which was not bloody. Symptoms continued to grow progressively worse. He kept at work until night, and then had to stop. The second day he got a prescription from a physician who did not see him. The abdomen, at this time, was smaller and tympanitic. The third day was fairly comfortable, due to medicine, probably morphia, given by his physician. The fourth day he began vomiting everything taken in the way of food and medicine; pain severe and paroxysmal. On the fifth day he was admitted to the Hospital. Examination on admission showed the following condition: Fairly well nourished; expression anxious; mucous membranes normal. Tongue coated with thick white coating. Patient hiccoughing, and at times doubled up with pain. No appetite. Says he has passed nothing from bowels except mucus for seven or eight days. Micturition normal. Pulse weak and rapid. On January 9, under ether, he was operated upon by Dr. Halsted. A long incision was made in the linea alba running to the left of the umbilicus. The tissues were incised down to the peritoneum, and bleeding points clamped. Peritoneum was carefully opened, and an enormously distended colon protruded through the wound, which was found to have described a complete volvulus, the constriction being at the sigmoid flexure and also at the ileo-cæcal valve. The gut at these points was somewhat darkened in hue, but only slightly; the peritoneum everywhere exhibited the usual glistening surface. There was more fluid than normal. The mesocolon was very large and broad. When the bowel was replaced in its natural position a silk œsophageal tube was passed into the rectum and through the sigmoid flexure, and much gas and a grumous liquid with fecal odor were discharged. The patient reacted favorably, and the next day felt very comfortable. He made an uninterruptedly good recovery," and has enjoyed good health up to the time of his second attack, the history of which is as follows:

Was admitted to the Hospital, December 22d, 1892. Since he left the Hospital has been well up to five days ago, when he had a return of the former symptoms, pain in the abdomen, tympanites, and bowels unmoved notwithstanding the use of purgative medicine and turpentine enemata. For the last three or four days has vomited invariably after taking anything into his stomach. Pain in back and lumbar region, spasmodic in character, was a prominent feature. Patient walked into the Hospital. On admission: Fairly well nourished, good color, face worn and expression anxious. Pulse good and regular; temperature about normal. On entrance to hospital was given an enema with hips elevated, which was fol-

lowed by the expulsion of considerable gas and some little fecal matter. This treatment was continued for several days with about the same result. He expressed himself as feeling better, and the distension was not so great after two or three days. His condition was so good upon entrance that an operation did not seem to be indicated at once, and his condition remained unchanged for four or five days. Dr. Osler saw him and thought a continuation of the treatment that had been used advisable. We therefore continued the enemata. He was on liquid diet in the meantime, and took it with relish. He vomited only occasionally. After he had been in the Hospital about a week his distension began to increase a little, and following the enemata little or no flatus and no fecal matter were expelled. He was evidently beginning to lose ground, so it was decided not to wait longer, but to relieve his condition at once. On December 29th, seven days after entrance, under ether, a long incision was made through the abdominal wall, extending nearly from the ensiform cartilage to the pubes, just to the right of the median line, to avoid the old cicatrix, which was on the left side. I feared that there might have been some intestine adherent to the old scar, which proved to be the case; a portion of the small intestine was found adherent to the line of the former operation. As soon as the peritoneum was incised, the enormously distended colon presented in the opening forced itself out through the wound. The intra-abdominal pressure was so great that it was impossible to restrain it. It came so quickly and with so much force that its position in the abdominal cavity could not be determined, but it apparently described a complete turn as it came out, accompanied by a loud gurgling sound. After the internal pressure had been relieved somewhat by the escape of a portion of the colon, the remainder was carefully examined *in situ*. A band of adhesion was found extending from the original scar to the upper portion of the sigmoid flexure. The band was almost as thick as the little finger and about 6 cm. long. The sigmoid flexure seemed to have been constricted here, as just at this point there was apparent a little discoloration of the serous surface. The band was ligated close to each end and excised. A rectal tube was passed, followed by the escape of a large volume of gas, and immediately the colon collapsed. The whole length of the large intestine from the ileo-cæcal valve to the rectum was carefully explored. It was thought that possibly there might be some malignant disease or stricture elsewhere, but nothing abnormal was found. As soon as a considerable amount of gas had escaped, an enormous quantity of fecal matter followed, which continued at frequent intervals for several days. His condition subsequent to the operation was very satisfactory. He did not vomit once after he came out of ether, and had no trouble whatever. All his symptoms were relieved, and he has been perfectly comfortable ever since.

Of course there is liability to a return of the trouble. At the time of the operation the feasibility of doing something to prevent this return was considered. The only means that suggested itself was to shorten the mesocolon, as advocated by Senn. But it was thought that owing to the great length of the mesocolon, such a procedure would increase rather than lessen the danger of a recurrence.

The operation was done 18 days ago. Although the outer dressings have been changed, the protective has not been removed up to this time. As I remove it, you observe that the wound has healed perfectly.

Dr. HALSTED.—According to Braun* of Königsberg, detorsion has been accomplished in seventeen cases of volvulus of the sigmoid flexure. Six, or about 35 per cent of these cases recovered. Of the 11 fatal cases, 2 died of collapse soon after the operation, 5 of peritonitis or gangrene of the intestine, 1 of pneumonia, 1 of a recurrence of the volvulus, 1 of typhoid fever, and 1, probably of tuberculous meningitis.

In two instances the volvulus recurred; in one, immediately after the operation, and in the other, four months after the operation. Both of these cases died; one without a second operation, and the other on the third day after the operation, presumably of typhoid fever.

Dr. Finney's case is, therefore, the second in which detorsion for recurrent volvulus of the sigmoid flexure has been accomplished, and the first in which it has been successfully accomplished.

Four patients for whom detorsion was not performed because the volvulus was not discovered at the time of the operation, died soon after the operation. Resection of the intestine for volvulus of the sigmoid flexure has been done in two instances. One of the patients died on the 32d day, from perforation of an ulcer of the stomach; the other recovered from the operation, with, however, a fecal fistula.

All of the eight cases upon whom enterotomy was performed died within a very short time.

It is clear from these statistics that for volvulus of the sigmoid flexure detorsion should be performed as soon as possible. The proposition of Treves, to puncture the intestine and then perform colotomy on the descending colon, should, as Braun says, not for a moment be considered. To prevent a recurrence of the volvulus it has been proposed by Senn to shorten the mesocolon. Senn has accepted the popular notion that a long mesocolon is the predisposing cause of volvulus of the sigmoid flexure. This notion has not, however, the support of facts. In almost all of these cases a short, thick mesocolon has been found. Gruber has found the mesocolon as short as 1″ and not longer than 2½″ in the cases which he has examined post mortem. Küttner has seen both arms of the sigmoid flexure lying close together.

If one should attempt to shorten the mesocolon in such cases he would, as Braun says, produce a sharp bend of the intestine. He might, furthermore, shut off the circulation to a disastrous extent.

In our case the mesentery seemed quite as long if not longer than the normal mesosigmoideum. May it not after all be possible that a long mesentery is often the predisposing cause of the volvulus, and that an originally long mesentery may, by adhesions and other processes of peritonitis, become a short and thick one?

There is a physiological volvulus of the sigmoid flexure. A torsion of as much as 180° has several times been observed.

There is also a physiological volvulus of the large intestine upon the small intestine. The entire navel loop is concerned in this volvulus. It occurs in the embryo when the flexura linealis crosses the flexura duodeno-jejunalis. It is probably this twist which causes the fold known as the plica duodeno-jejunalis, and the fossa known as Treitz's fossa or the recessus duodeno-jejunalis or recessus retroperitonealis. It is a subject for investigation whether the ligamentum mesenterio-mesocœlicum owes its occasional existence to a physiological volvulus of the sigmoid flexure.

* Langenbeck's Archives, 1892.

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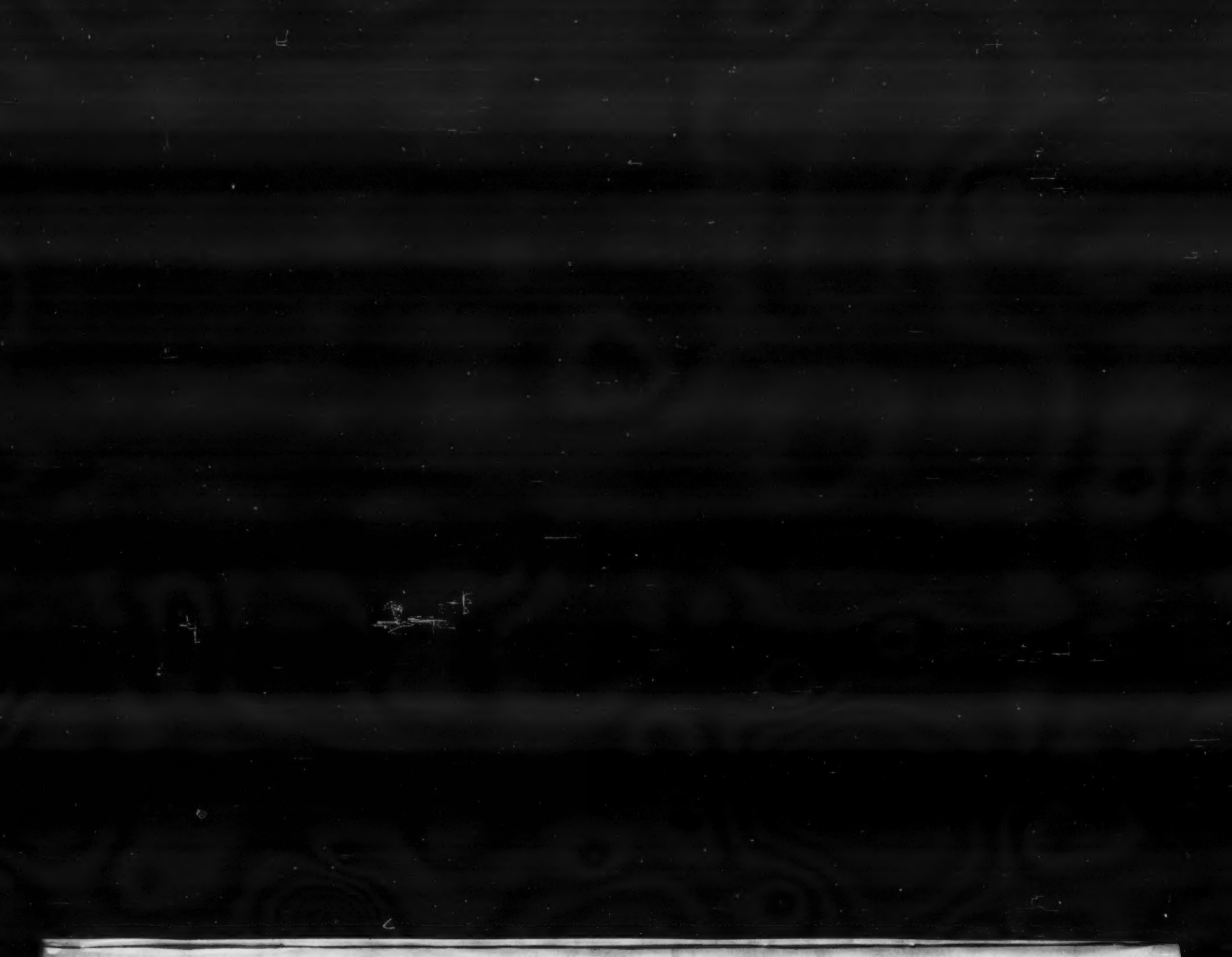
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